Claims:

1. A polarization mitigated wavelength determination apparatus comprising:

an optical source that produces light that sweeps an optical spectrum;

a polarization element that changes the polarization of the light at a first rate;

an optical element that produces a spectral response from the polarization changed light, wherein the spectral response includes a spectral feature of interest, and wherein the spectral feature of interest has a bandwidth that is significantly greater than the first rate;

a receiver network in optical communication with the optical element that produces a received signal from the spectral response; and

a data processing unit that calculates a wavelength corresponding to the spectral feature of interest.

2. The apparatus of claim 1 wherein calculating the wavelength is performed in a manner that is insensitive to variations or noise in the received signal.

3. The apparatus of claim 1, further including an unknown polarization transformation element.

4. The apparatus of claim 1, further including a varying polarization transformation element.

5. The apparatus of claim 1 wherein the optical source includes a tunable laser.

6. The apparatus of claim 1 wherein the optical source includes a broadband light source and a tunable filter.

7. The apparatus of claim 1 wherein the polarization element is a passive depolarizer.

8. The apparatus of claim 7 wherein the passive depolarizer includes a device selected from a group comprised of wedge depolarizers, cascaded feed-back loop depolarizers, and Lyot depolarizers.

9. The apparatus of claim 1 wherein the polarization element is an active depolarizer.

10. The apparatus of claim 9 wherein the active depolarizer is a polarization scrambler.

11. The apparatus of claim 1 wherein the optical element includes a fiber Bragg grating.

12. The apparatus of claim 1 wherein the data processing unit calculates the filter wavelength using a least-squares fit of a quadratic curve to the received signal.

13. The apparatus of claim 1 wherein the data processing unit calculates the filter wavelength using a method selected from a group comprising, center of mass calculations, centroid calculations, fitting to a polynomial curve, fitting to a Gaussian curve, fitting to a Lorentzian curve, and fitting to a trigonometric function curve.

14. The apparatus of claim 1 wherein the receiver network includes a photo-detector.

15. The apparatus of claim 1 wherein the receiver network includes a low-pass filter.

16. A wavelength determination apparatus comprising:

an optical source that produces light that sweeps across a wavelength range in a first time period;

a polarization element that changes the polarization of the light at a first rate;

an optical element that produces a spectral response from the polarization changed light, wherein the spectral response includes a spectral feature of interest, wherein the optical element produces polarization-dependent wavelength shifts, and wherein the spectral feature of interest has a bandwidth that is significantly greater than the first rate;

a receiver network that produces a received signal from the spectral response;

a low-pass filter that filters received signals that correspond to the first time period; and

a data processing unit that calculates a wavelength corresponding to the spectral feature of interest from the filtered received signal.

17. The apparatus of claim 16 wherein the optical source includes a tunable laser.

18. The apparatus of claim 16 wherein the optical source includes a broadband light source and a tunable filter.

19. The apparatus of claim 16 wherein the polarization element is a passive depolarizer.

20. The apparatus of claim 19 wherein the passive depolarizer includes a Lyot depolarizer.

21. The apparatus of claim 16 wherein the polarization element is an active depolarizer.

22. The apparatus of claim 21 wherein the active depolarizer is a polarization scrambler.

23. The apparatus of claim 16 wherein the optical element comprises a fiber Bragg grating.

24. The apparatus of claim 16 wherein the data processing unit calculates the wavelength using a least-squares fit of a quadratic curve.

25. The apparatus of claim 16 wherein the receiver network includes a photo-detector.

26. The apparatus of claim 16 wherein the data processing unit includes a computer.

27. The apparatus of claim 16 wherein the data processing unit performs a curve fit during calculation of the wavelength.

28. The apparatus of claim 27 wherein the curve fit is selected from a group consisting of a quadratic curve, a polynomial curve, a Lorentzian curve, a Gaussian curve, a trigonometric function curve.

29. The apparatus of claim 16 wherein the data processing unit performs center of mass and/or centroid calculations during calculation of the wavelength.

30. The apparatus of claim 16 wherein the low pass filter includes an analog filter.

31. The apparatus of claim 16 wherein the low pass filter includes a digital filter.

32. A method of compensating for polarization induced measurement dependency comprising:

sweeping light across an optical spectrum;

changing the polarization of the sweeping light at a first rate to produce changing polarization light;

producing a spectral response of an optical element in response to the changing polarization light, wherein the spectral response has a spectral feature of interest and a bandwidth that is significantly greater than the first rate;

converting the spectral response to received signals; and

processing the received signals to determine a wavelength that is insensitive to variations and noise at or above the first rate in the received signals.

33. The method of claim 32 wherein processing the received signals are low pass filtered.

34. The method of claim 32 wherein processing the received signals includes calculating the wavelength.

35. The method of claim 34 wherein calculating the wavelength includes performing a least-squares fit of a quadratic curve.